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㉓ **Catamenial tampon.**

㉔ A catamenial tampon (10) for absorbing menstrual fluid includes a compressed pledget (12) having a major (14) and a minor (16) radius of curvature. Zones (18, 20) of different density fibers are arranged adjacent to each radius of curvature and the zones can extend substantially the entire length of the pledget (12). The pledget is constructed of absorbent fibers which according to one embodiment

are enclosed by a cover (28). A withdrawal string (36) is attached to the pledget (12) and facilitates removal of the tampon from a woman's vagina. The absorbent is compressed into an elongated, generally cylindrically shaped pledget having a zone of high density fibers (20) and a zone of low density fibers (18). After compression, the low density fibers will expand and form a curved tampon (20).

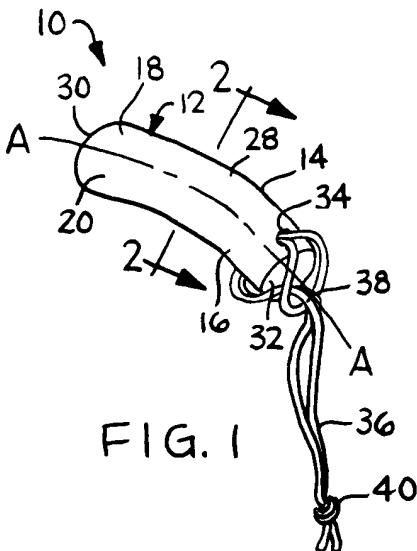


FIG. 1

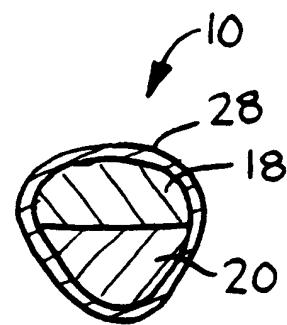


FIG. 2

This invention relates to a catamenial tampon for absorbing menstrual fluid.

Currently, there are two basic types of tampons used for feminine hygiene. The first type is a digital tampon which can be inserted into a woman's vagina by the user's fingers. The second type is a tampon retained in an applicator wherein the tampon is inserted into a woman's vagina via the applicator. Both types of tampons are commonly made by folding or rolling a loosely associated rectangular strip of absorbent material into a blank and then compressing the blank into a cylindrically shaped product known as a plectget. The plectget may or may not have a cover. In both types of tampons, a withdrawal string is attached to the plectget to provide a means for removing the tampon from the woman's vagina. In the applicator style tampon, the tampon is normally assembled into the applicator prior to being wrapped and packaged.

Until now, most tampons have been manufactured having a straight cylindrical profile. Representative samples of such tampons are taught in U.S. Patents 3,340,874; 3,854,481 and 5,047,024. A disadvantage of a straight profile is that, in the female body, the vaginal cavity is curved, and a woman can experience discomfort when trying to insert a straight tampon into her vagina.

There are patents which teach the use of a curved applicator or stick to facilitate insertion of a straight tampon into a woman's vagina. U.S. Patents 1,224,735 and 4,755,166 are representative. However, these various types of applicators still utilize a straight tampon. U.S. Patent 3,765,417 issued to Crockford, and assigned to the present assignee, is one patent which does teach a tampon having an arcuate shape which is designed to be utilized with a curved applicator. This curved tampon is formed from folding a sheet of compressed, absorbent material and has a slight curvature. However, no mention is made to forming a curved tampon, having a generally cylindrical shape, which could be inserted without an applicator. Furthermore, Crockford does not teach a curved tampon having zones of different density fibers which maintain the curvature of the tampon prior to use.

Now, a catamenial tampon has been developed which is curved to correspond to the curvature of a woman's vagina. The tampon can be easily inserted into a woman's vagina without discomfort and has zones of different density fibers which maintain the curvature of the tampon prior to use.

The tampon of this invention is evident from independent claim 1. Further advantageous features, aspects and details of the invention are evident from the dependent claims, the description, and the drawings. The claims are intended to be understood as a first non-limiting approach of de-

fining the invention in general terms.

More particularly, the invention refers to a curved tampon having zones of different density fibers which maintain the curvature of the tampon prior to use.

The catamenial tampon for absorbing menstrual fluid according to one aspect of this invention includes a compressed plectget having a major and a minor radius of curvature. The plectget has zones of different density fibers arranged adjacent to the major and minor radii of curvature. The zones of different densities can extend substantially along the entire length of the plectget. The plectget is constructed from an absorbent optionally enclosed by a nonwoven cover. A withdrawal string is attached approximately one end of the plectget. The withdrawal string is used to remove the tampon from the vagina after the tampon has absorbed menstrual fluid. The absorbent is compressed into an elongated, generally cylindrically shaped plectget having a zone of high density fibers and a zone of low density fibers. After compression, the low density fibers will expand and form a curved tampon.

The invention provides a catamenial tampon for absorbing menstrual fluid and more specifically provides a catamenial tampon having a curved or arcuate shaped plectget.

Another aspect of this invention is to provide a catamenial tampon having a curved plectget which is rigid and self sustaining prior to use.

Still another aspect of this invention is to provide a curved tampon which closely approximates the curvature of a woman's vagina and is rigid enough to be employed as a digital tampon.

Still further, an aspect of this invention is to provide a curved tampon which is easier to insert into a woman's vagina than a straight tampon.

Other aspects and advantages of the present invention will become more apparent to those skilled in the art in view of the following description and the accompanying drawings.

Fig. 1 is a perspective view of a catamenial tampon having a compressed plectget with a major and a minor radius of curvature and having a zone of low density fibers located adjacent to the major radius of curvature and a zone of high density fibers located adjacent to the minor radius of curvature.

Fig. 2 is a cross-sectional view of the catamenial tampon shown in Fig. 1 taken along line 2--2.

Fig. 3 is a perspective view of a wedge-shaped absorbent which can be used to construct the curved tampon.

Fig. 4 is a perspective view of a compressed, generally cylindrically shaped plectget having an axial opening formed in an end thereof which can

accommodate a stick.

Fig. 5 is a schematic view of a curved tampon having a curved stick removably inserted into an opening formed in one end of the plegget for facilitating insertion of the tampon into a woman's vagina.

Referring to Fig. 1, a catamenial tampon 10 is shown which is capable of absorbing menstrual fluid, blood, etc. during a woman's menstrual period. The tampon 10 includes a compressed plegget 12 having a central longitudinal axis labeled A--A. The central longitudinal axis A--A is flanked by a major radius of curvature 14 and a minor radius of curvature 16. The central longitudinal axis A--A can be formed on an arc having a radius of curvature of about 3-8 inches (76.2-302.2 mm), preferably about 4-7 inches (101.6-177.8 mm). The major and minor radii of curvature, 14 and 16 respectively, are located on opposite sides of the longitudinal axis A--A. The major radius of curvature is formed on a radius which is larger than the radius on which the minor radius of curvature is formed. Another way of defining the radii of curvature 14 and 16 is that an arc forming the longer outer surface of the tampon 10 is the major radius of curvature 14 and an arc forming the shorter outer surface of the tampon 10 is the minor radius of curvature 16.

The plegget 12 can be formed from any suitable absorbent material made from natural or artificial fibers, including: cotton, polyester, cellulose, acetate, nylon, polypropylene, rayon or blends thereof. The absorbent can also be a nonwoven, bonded carded web comprised of cotton and rayon fibers. A homogeneous blend of about 50-75 percent bleached cotton linter fibers and about 25-50 percent rayon fibers works well. When a cotton and rayon blend is utilized, the cotton fibers can be of various denier and can be of different lengths. The moisture content of the cotton fibers should be in the range of about 10-15 percent. The rayon fibers should have a tex of about 0.3 - 0.9 (denier of about 3-8), a staple length of about 1-2 inches (25.4-50.8 mm) and they should also possess high crimp properties. The rayon fibers should most likely have a dull finish. The moisture content of the rayon fibers should be in the range of about 10-12 percent.

Referring to Fig. 2, the plegget 12 contains at least two zones of different density fibers 18 and 20. A zone of low density fibers 18 is arranged adjacent to the major radius of curvature 14, and a zone of high density fibers 20 is arranged adjacent to the minor radius of curvature 16. Each zone, 18 and 20, occupies at least about 25 percent of the volume of the plegget 12 and, preferably, occupies at least 40 percent of the volume of the plegget 12. Most preferably, the zone of low density fibers 18

5 occupies about 60 percent of the volume of the plegget 12, while the zone of high density fibers 20 occupies about 40 percent of the volume of the plegget 12. It should be noted that the particular percent of each zone can vary upon one's particular tampon design and/or manufacturing process.

10 Referring again to Fig. 1, the zones 18 and 20 can extend substantially the entire length of the plegget 12 and can be aligned adjacent to one another. However, if desired, the zones 18 and 20 can extend over only a portion of the entire length of the plegget 12. For example, the zones 18 and 20 can extend over only the central portion of the plegget 12.

15 Referring to Fig. 3, an absorbent 22 having a varying thickness is depicted. The absorbent 22 is shown having a wedge- shaped, cross-sectional configuration and is formed by joining two absorbent layers 24 and 26 together. However, it should be noted that the absorbent 22 could be formed from a single sheet of fibers. The absorbent 22 has an overall length of between about 2.5-4.0 inches (63.5-101.6 mm), a width of between about 1-2 inches (25.4-50.8 mm), and a thickness which ranges from between about .5 to 1.5 inches (12.7-38.1 mm) at its thickest point to a thickness of between about .125 to .5 inches (3.2-12.7 mm) at its narrowest point. The zone of high density fibers 20 will correspond to the thicker portion of the absorbent 22 and will contain a greater volume of fibers than the zone of low density fibers 18. The zone of low density fibers 18 corresponds to the thinnest portion of the absorbent 22.

20 The absorbent 22 can optionally be enclosed by a cover 28. The cover 28 can be formed from a nonwoven material such as a polyolefin, particularly polypropylene or polyethylene. A preferred material is spunbond. The cover 28 is beneficial in assuring that the fibers of the absorbent 22 do not directly contact the inner walls of a woman's vagina. This assures that no fibers will be left behind in the vagina after the tampon 10 has been removed. The cover 28 can be tucked into distally spaced ends 30 and 32 of the absorbent 22 so as to completely surround and enclose the absorbent fibers. The cover 28 can also be constructed from a heat-sealable material to assist in bonding it to the absorbent 22, such as by heat and/or pressure.

25 An opening 34 can be formed through both the cover 28 and the absorbent 22 so as to provide a means for attaching a withdrawal string 36, see Fig. 1. The opening 34 is normally aligned perpendicular to the central longitudinal axis A--A of the plegget 12. The withdrawal string 36 is preferably attached to the absorbent 22 before it is compressed into the plegget 12. The opening 34 should be located close to the distal edge 32. This will enable the withdrawal string 36 to be inserted through the

opening 34 and looped upon itself at 38. A knot 40 can then be formed near the free ends of the withdrawal string 36 to assure that the string 36 does not separate from the absorbent 22. The withdrawal string 36 provides a means for removing the tampon 10 from the woman's vagina after the tampon has absorbed a certain amount of menstrual fluid.

The front or insertion end 30 of the pledget 12 can be rounded to facilitate insertion into a woman's vagina, while the opposite end 32 is relatively flat. The rounding of the insertion end 30 is normally done during the compression of the absorbent 22. The rounding of the insertion end 30 is optional but is generally preferred by the consumer.

Referring again to Fig. 3, the absorbent 22 is shown before the withdrawal string 36 has been attached and before compression. In the typical manufacturing process, the withdrawal string 36 would be attached to the absorbent 22 before the absorbent 22 is subjected to compression. The absorbent 22 can be compressed in an elongated, cylindrical mold cavity while at a moisture content of between about 5-15 percent, preferably about 10-12 percent. The absorbent 22 can be subjected to an end compression force of between about 5 to 21 N/mm² (about 750-3,000 pounds per square inch), preferably between about 10 to 14 N/mm² (about 1,500-2,000 pounds per square inch). The pressure can be applied for a desired time period, generally for a period of time greater than .25 seconds, preferably from about .25-1.5 seconds. The resulting density of the compressed pledget 12 in the area of the minor radius of curvature can range from about 159 - 239 kg/m³ (about 10-15 pounds per cubic foot) at a moisture content of about 12 percent, while the density of the pledget 12 in the area of the major radius of curvature can range between about 6-10 pounds per cubic foot at a moisture content of about 12 percent.

The mold cavity can also be heated to an elevated temperature, for example, to a temperature of between about 10-93°C (about 50-200°F), preferably between about 32-38°C (about 90-100°F). Compression of the absorbent 22 yields an elongated, generally cylindrically shaped pledget 12. The pledget 12 will have an overall length of between about 1 and 1.5 inches (25.4-38.1 mm), preferably about 1.25 inches (31.75 mm), and can vary in diameter from about .30-.75 inches (7.6-19.1 mm). The pledget 12 normally has a weight of between about 2.8 to 4.2 grams.

The pledget 12 is normally straight when it exits the mold cavity but quickly blossoms into a curved shaped pledget as is shown in Fig. 1. The curved shape is obtained by the expansion of the low density fibers in zone 18. The fibers in the high

5 density zone 20 tend to retain their compressed shape and, therefore, do not expand, at least not to the same extent, nor as rapidly, as the fibers in the low density zone 18. The release or expansion of the low density fibers gives the tampon 10 its novel arcuate shape while maintaining a rigid configuration. The rigid configuration permits the tampon 10 to be utilized as a digital tampon which can be inserted into a woman's vagina without the assistance of an applicator.

10 It should be noted that, as the fibers of the low density zone 18 expand outward to give the tampon 10 its arcuate shape, the cross-sectional shape of the tampon 10 may vary from a true cylinder to more of a teardrop or oval-type configuration. The exact configuration which will be obtained will be dependent upon the type of fibers used, the amount the fibers are compressed, the moisture content of the fibers, the shape of the mold cavity, etc. Once the tampon 10 has been inserted into a woman's vagina, the tampon will absorb menstrual fluid, blood, etc., and the fibers in both the low and high density zones 18 and 20 will expand. This action will cause the tampon 10 to straighten out 15 into a generally elongated, cylindrical shape.

20 Referring to Fig. 4, a compressed pledget 42 is shown having a rounded insertion end 30 and a flat opposite end 32. The pledget 42 is enclosed by a cover 28 and has an opening 30 formed radially therethrough for accommodating a withdrawal string 36. The pledget 42 also contains an axial opening 44 coaxially aligned with the central longitudinal axis A-A. The length of the opening 44 can be about .25-.75 inches (6.35-19.5 mm), preferably about .625 inches (15.9 mm). The axial opening 44 can be formed, as the absorbent 22 is being compressed in the mold cavity, by inserting a pin into one end of the mold cavity. As the absorbent fibers are compressed around the pin, the opening 44 is formed. When the pin is removed, the opening 44 is exposed. The axial opening 44 is designed to accommodate the end of a stick 46. The stick 46 can be either straight or curved and, preferably, has a curve equal to the arc of the pledget 12. By using a curved stick having an arc 25 similar to that of pledget 12, one can facilitate insertion of the tampon 10 into a woman's vagina in a comfortable fashion.

30 Referring to Fig. 5, a curved stick tampon 48 is depicted having a curved stick 46 which can assist a woman in positioning the tampon 10 into her vagina. Once the tampon 10 is inserted into the vagina, the stick 46 is withdrawn from the opening 44 and can be properly discarded.

35 40 45 50 55 Although not specifically shown in the figures, it should be noted that the curved tampon 10 can also be utilized with a curved applicator. The applicator can be constructed out of various materi-

als, including: paper, cardboard, paperboard, plastic or other kinds of thermoplastic materials. An example of a curved tampon applicator is taught in U.S. Serial No. 07/537,677 filed June 14, 1990, to Paul et al. This patent application is incorporated by reference and made a part hereof.

Claims

1. A tampon (10) comprising:
 - a) a curved absorbent (12) having a major (14) and a minor (16) radius of curvature with zones (18, 20) of different densities arranged adjacent to said major and minor radii of curvature; and
 - b) a withdrawal string (36) attached to said absorbent.
2. The curved tampon of claim 1 wherein the absorbent is formed from compressed cotton and rayon fibers, said absorbent having a major and minor radius of curvature with zones of different densities corresponding to each radius, said zones being aligned adjacent to one another.
3. The tampon of any one of the preceding claims wherein said curved absorbent has a major and minor radius of curvature with zones of different density fibers arranged adjacent to each of said radii, each of said zones (18, 20) extending substantially the entire length of said absorbent.
4. The tampon of any one of the preceding claims wherein said absorbent has distally spaced first and second ends, said second end (32) having an opening (44) formed therein; and a stick (40) being removably inserted into said opening (44), said stick facilitating insertion of said tampon into a woman's vagina.
5. The tampon of any one of the preceding claims wherein said absorbent having a central longitudinal axis (A-A) formed on an arc has a radius of between about 3-8 inches (about 76.2 - 302.2 mm).
6. The tampon of any one of the preceding claims having further a cover (28), enclosing said absorbent.
7. The tampon of any one of the preceding claims wherein said zone (20) aligned adjacent to said minor radius of curvature has a greater density than said zone (18) aligned adjacent to said major radius of curvature (14).
8. The tampon of any one of the preceding claims wherein said zone (20) aligned adjacent to said minor radius of curvature (26) has a greater volume of fiber than said zone (18) aligned adjacent to said major radius of curvature (14).
9. The tampon of any one of the preceding claims wherein each of said zones (18, 20) occupies at least about 25% of the volume of said absorbent.
10. The tampon of any one of the preceding claims wherein said absorbent is comprised of a blend of about 50-75% cotton fibers and about 25-50% rayon fibers.
11. The tampon of any one of the preceding claims wherein said absorbent has a central longitudinal axis (A-A) formed on an arc having a radius of between about 4 to 7 inches (about 101.6 - 177.8 mm).
12. The tampon of any one of the preceding claims wherein said absorbent includes a homogeneous blend of about 65-75% cotton fibers and about 25-35% rayon fibers.
13. The tampon of any one of the preceding claims wherein said zone (18) arranged adjacent to said major radius of curvature (14) has a density of between about 15.9 - 159 kg/m³ (about 1-10 pounds per cubic foot) at a moisture content of about 12 percent.
14. The tampon of any one of the preceding claims wherein said zone (20) arranged adjacent to said minor radius of curvature (16) has a density of between about 159 - 239 kg/m³ (about 10-15 pounds per cubic foot) at a moisture content of about 12 percent.
15. The tampon of any one of the preceding claims wherein said absorbent is comprised of two distinct wedge-shaped fibrous layers (24, 26) which are compressed into an elongated, generally cylindrical shaped peldorf (22).
16. The tampon of any one of the preceding claims wherein said absorbent contains first and second distally spaced ends (30, 32), said first end (30) having a rounded tip.
17. The tampon of any one of claims 6 to 16 wherein said cover (28) completely encloses said absorbent and is tucked into said first and second ends.

18. The tampon of any one of the preceding claims wherein said absorbent has a weight of between about 2.8-4.2 grams.

19. The tampon of any one of claims 4 to 18 as far as referring back to claim 4 wherein said stick (46) is curved. 5

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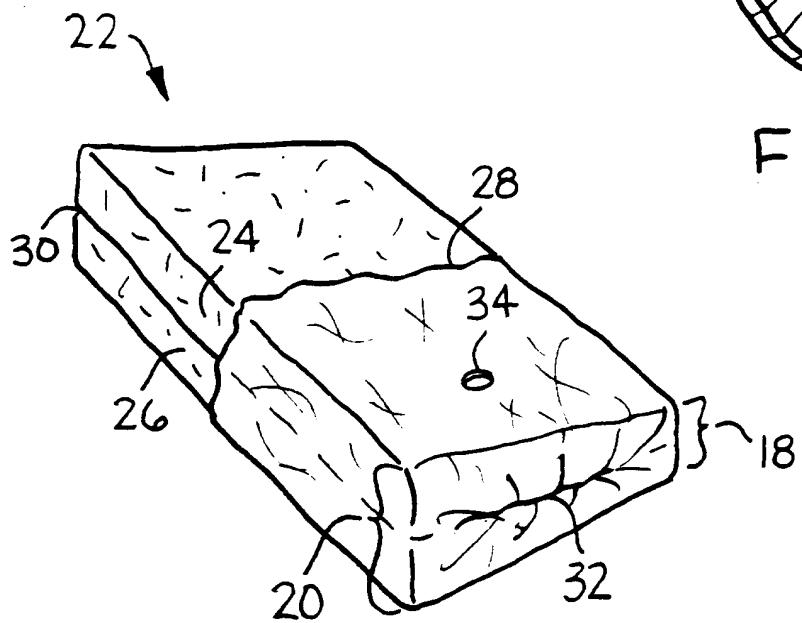
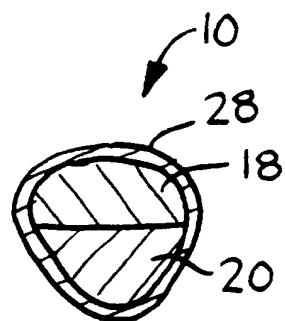
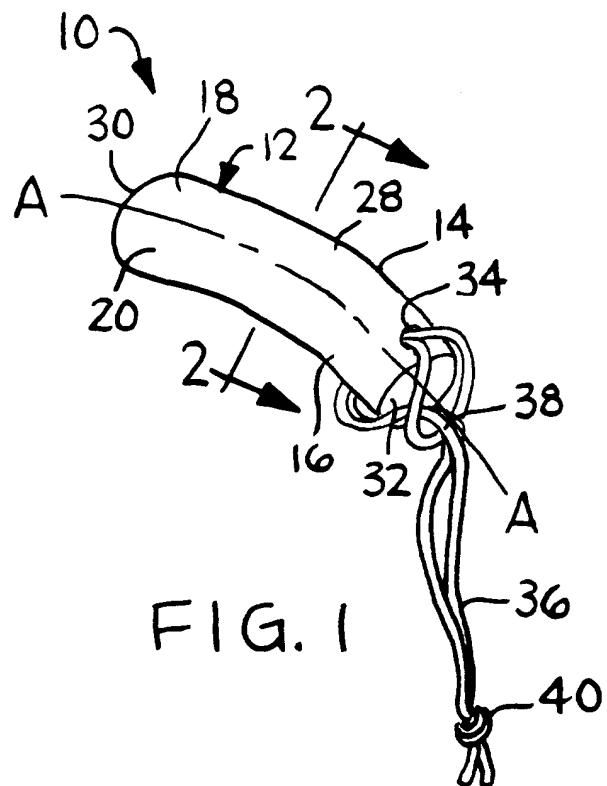
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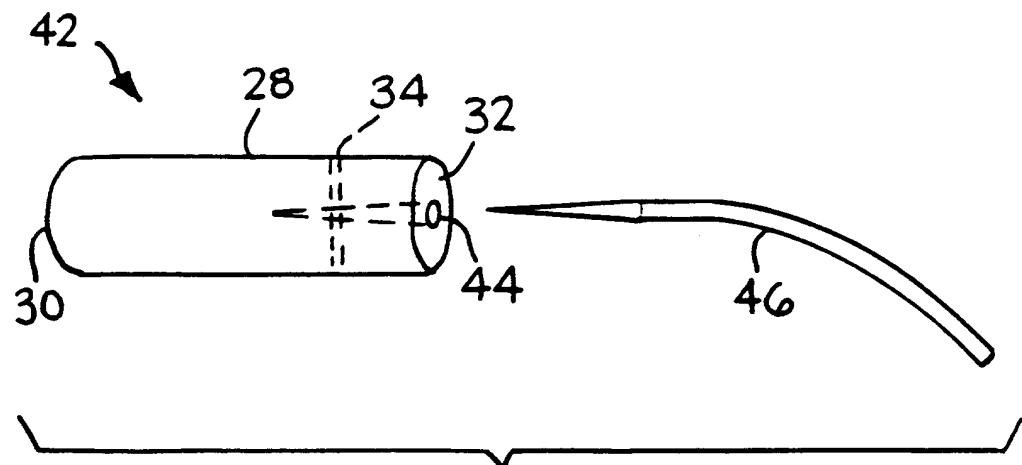


FIG. 4

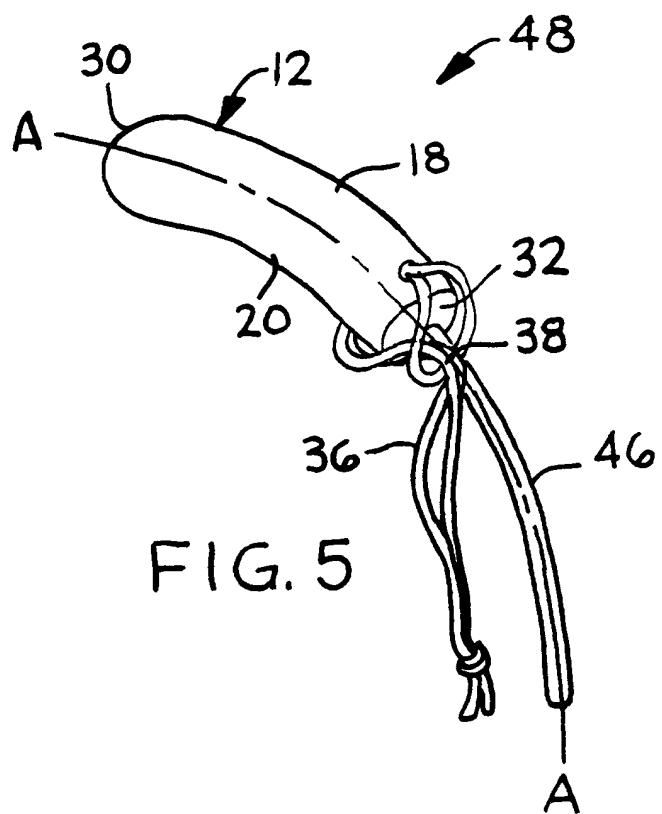


FIG. 5



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EUROPEAN SEARCH REPORT

Application Number

EP 92 11 2814

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.5)	
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	A61F13/20	
A	EP-A-0 243 250 (KIMBERLY-CLARK CORP.) * page 6, line 21 - line 35; claim 1; figures 7,8 *	1,5,16	A61F13/20	
A	CH-A-523 681 (KOBLER) * figures 4,5 *	1		
A	US-A-2 652 056 (LAY) * claim 1; figure 5 *	1		
A	US-A-3 063 453 (BRECHT) * claim 6; figures 6,7 *	1		
A	FR-A-384 249 (GOUPIL) * figures *	1,4,19		
A	DE-A-1 808 848 (VEREINIGTE PAPIERWERKE SCHICKEDANZ & CO) * claims 1,7-10 *	1		
D,A	US-A-3 765 417 (CROCKFORD) * the whole document *	1	TECHNICAL FIELDS SEARCHED (Int. Cl.5)	
	-----	-----	A61F	
The present search report has been drawn up for all claims				
Place of search	Date of completion of the search	Examiner		
BERLIN	04 MARCH 1993	KANAL P.		
CATEGORY OF CITED DOCUMENTS				
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